



# How NASA Astrophysics Transformed an HBCU: *University of the Virgin Islands*



David Morris  
University of the Virgin Islands  
College of Science and Mathematics  
Department of Chemical and Physical Sciences

237 Meeting of the American Astronomical Society  
Special Session: Enhancing Participation of Minority Serving Institutions in NASA Space Science  
January 11, 2021

# Outline

- Historical Background on Astronomy at UVI and Early NASA Involvement with Etelman Observatory
- Etelman Observatory VIRT and Recent Science Milestones
- Development of Broader NASA Activities at UVI and the UVI Physics B.S. Degree
- The NASA Impact at UVI

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# UVI physics grew from 2 faculty (2012)..



**David Morris**  
**(UVI):**  
**Role:** Physics  
Asst Professor;  
Observatory  
Director



**Dave Smith**  
**(UVI):**  
**Role:** Physics  
Professor;  
Physics AS lead

# ..to a physics research group (2016)..



**David Morris (UVI):**

**Role:** Physics program lead; Observatory Director



**Dave Smith (UVI-retired):**

**Role:** Physics Professor



**Brice Orange (OWIS):**

**Role:** Observatory Operations Manager

**Jan Staff (UVI):**

**Role:** Physics Asst Professor



**Nino Cucchiara (Marin College):**

**Role:** Physics Asst Professor



**Bruce Gendre (UWA):**

**Role:** VIRT resident astronomer

# ..to a NASA Astrophysics Team (2020)



**David Morris (UVI):**  
**Role:** Physics program lead; Observatory Director



**Dave Smith (UVI-retired):**  
**Role:** Physics Professor



**Brice Orange (OWIS):**  
**Role:** Observatory Operations Manager



**Jan Staff (UVI):**  
**Role:** Physics Asst Professor



**Dario Carbone (UVI):**  
**Role:** Physics Asst Professor



**Priya Gokuldas (UVI):**  
**Role:** VIRT Resident Observer



**Lev Horodyskyj (UVI):**  
**Role:** Physics Asst Professor



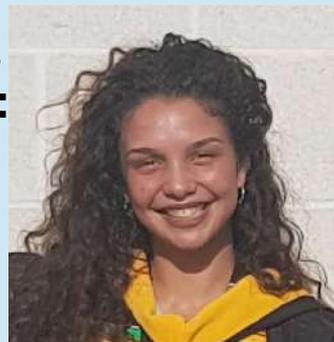
**Michael Henry (UVI):**  
**Role:** Physics Asst Professor



**Robert Strausbaugh (UVI):**  
**Role:** UVI NSF Machine Learning Post-Doc



**Nino Cucchiara (Marin College):**  
**Role:** Physics Asst Professor

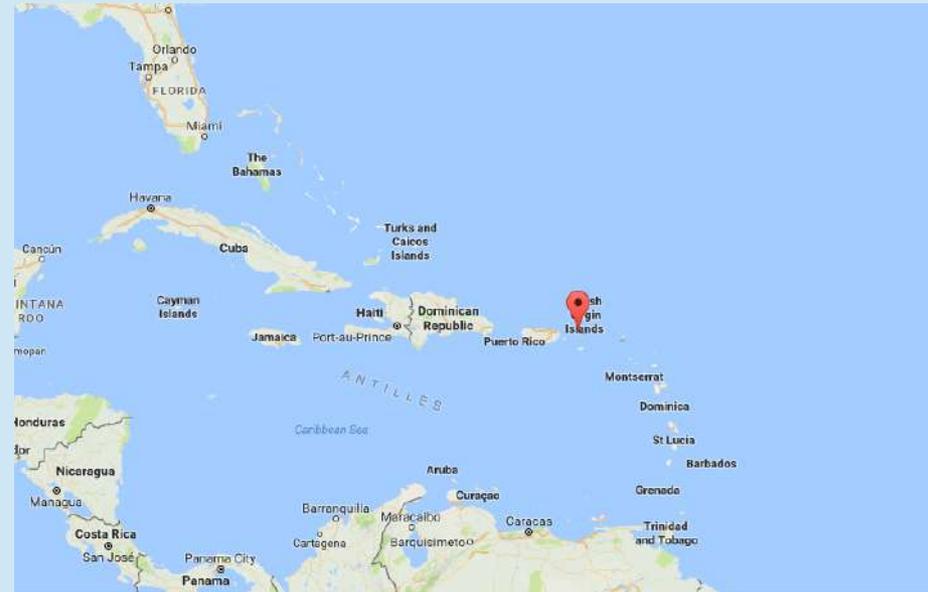


**Jonisha Aubain (UVI):**  
**Role:** UVI Adjunct Physics Instructor



**Orpha Penn (UVI):**  
**Role:** Physics Grants Manager

# The University of the Virgin Islands



- Located at the border between the Caribbean sea and the Atlantic Ocean
- HBCU Founded in 1962 (as CVI: 2-yr school)
- Campuses on St. Thomas and St. Croix
- ~2300 students
- Primarily USVI students (75%) with some US mainland and other Caribbean nationals
- Traditional majors of nursing, business, biology; recently engineering and physical science

# Astronomy established at UVI through donation of Etelman Observatory (1967)



**V.I. College  
Given Home,  
Observatory**

Dr. Lawrence C. Wanlass, president of the College of the Virgin Islands, has announced that the college has acquired the Bonne Resolution property on St. Thomas of Harry I. Etelman and his wife, Elizabeth.

The property includes a modern 10-room residence, an observatory with a 16-inch telescope, and approximately seven acres of land. This facility will be known as the Etelman Astronomical Center of the college.

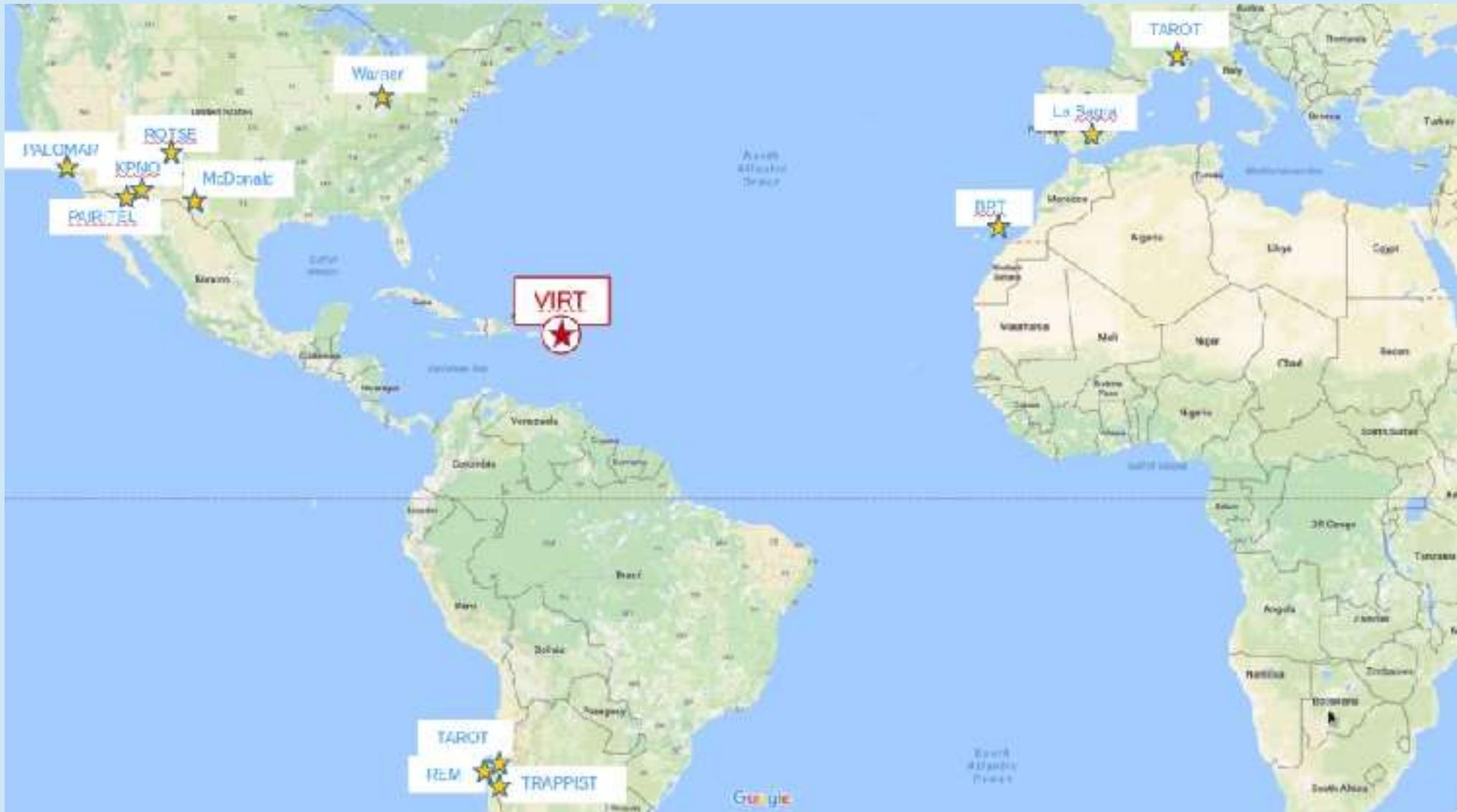
In his announcement, Dr. Wanlass declared:

"The college is most grateful to Mr. and Mrs. Etelman for their generous co-operation in the transfer of their St. Thomas property to the college.

"The observatory will be used for classes in astronomy, and the other facilities may be used for (See COLLEGE, Page 6)

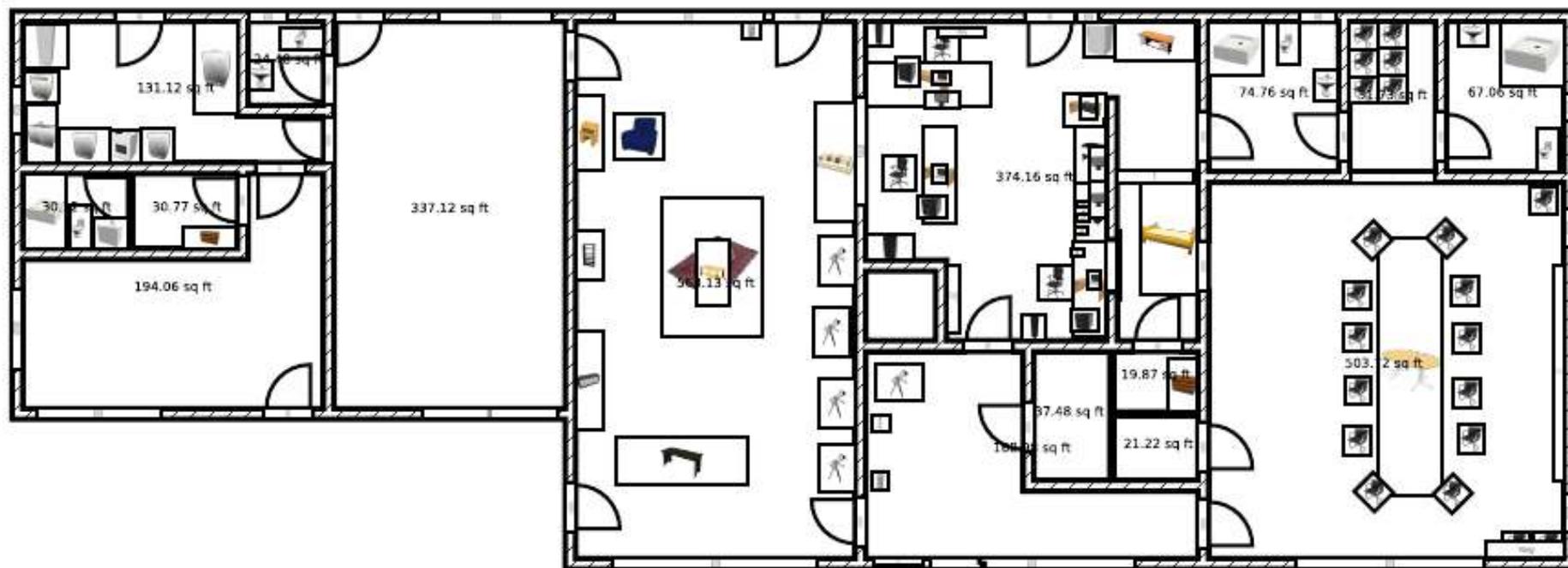


# VIRT on the robotic telescope landscape



- Opportunity in ~2000 to fill “gap” in world-wide follow-up of transients – particularly *Swift*
- But personnel turnover and technical challenges constrained progress in the 2000’s
- College of Charleston maintains facility almost exclusively from abroad in late 2000’s

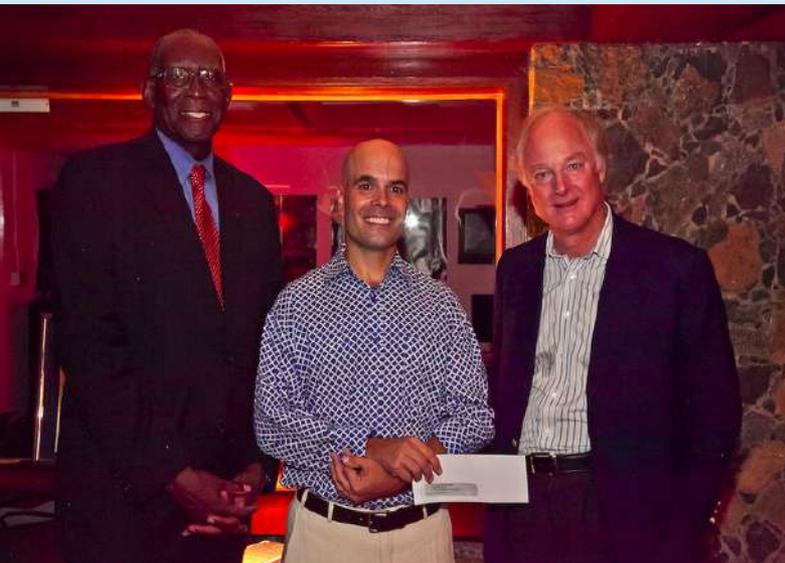
# Post-2000 Renovation: Etelman Observatory Science Center



# VIRT Installation: 2003



# Reopening to USVI Public: June 2012

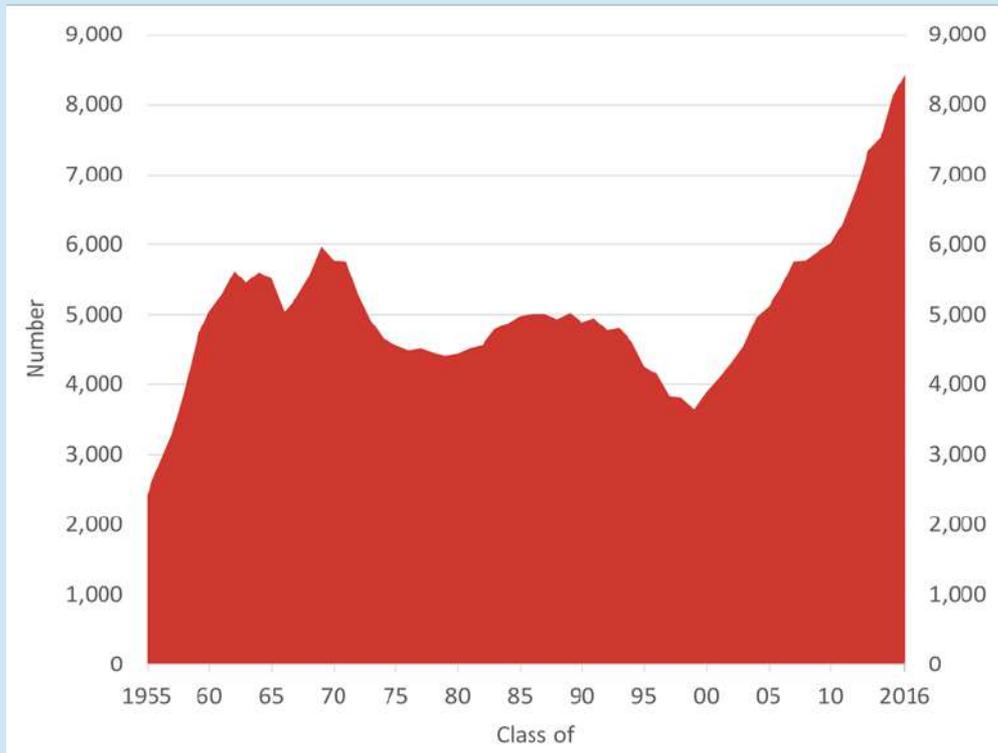


# Diversity in Physics Education

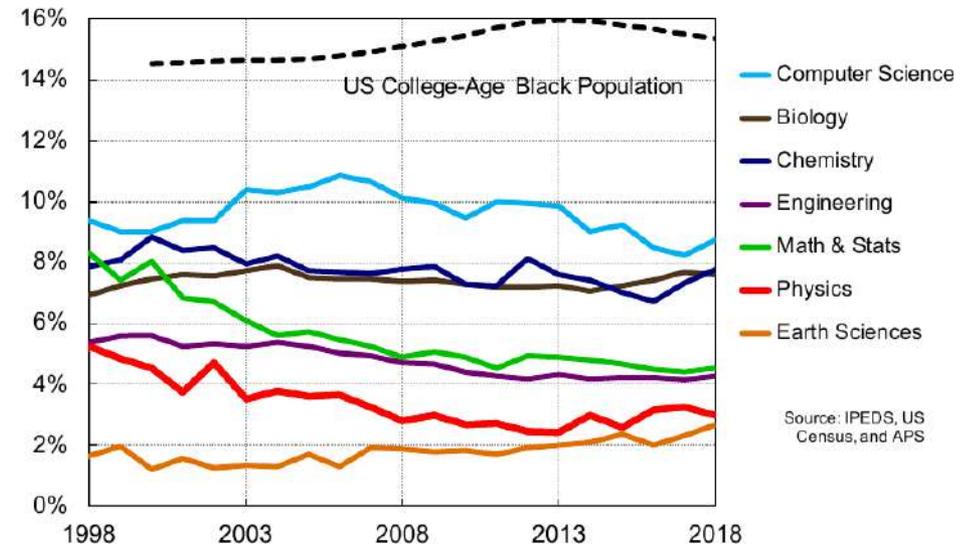
The number of physics degrees in the US is at its highest level ever

But physics degrees earned by under-represented students is falling

Physics Bachelor's Degrees Awarded.



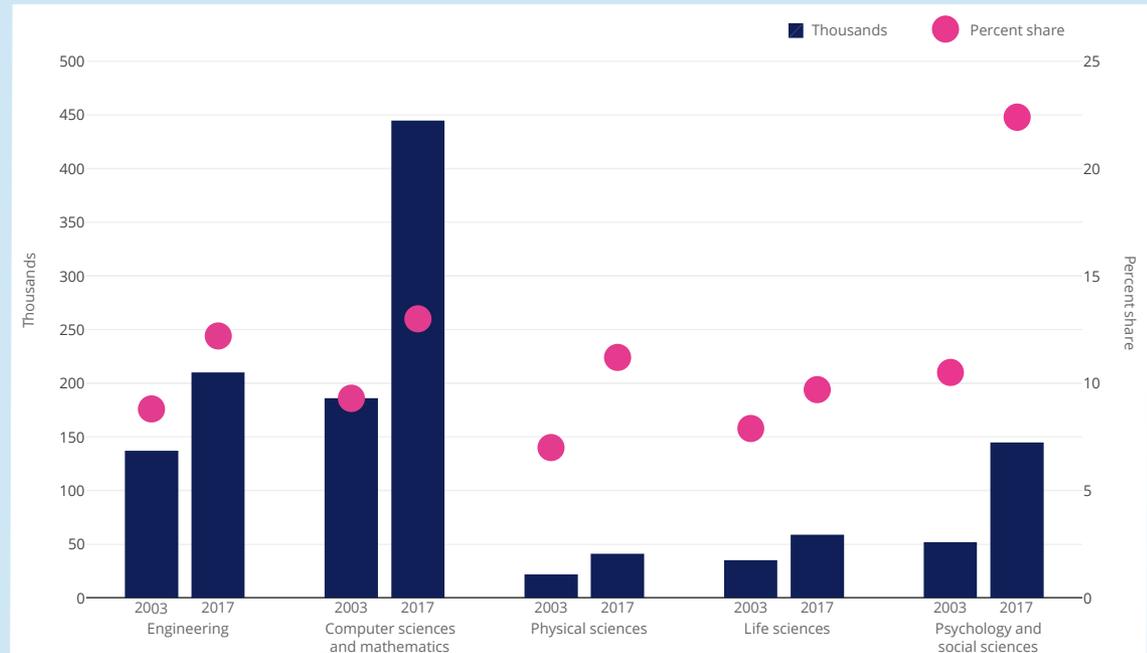
Bachelor's Degrees Earned by African Americans



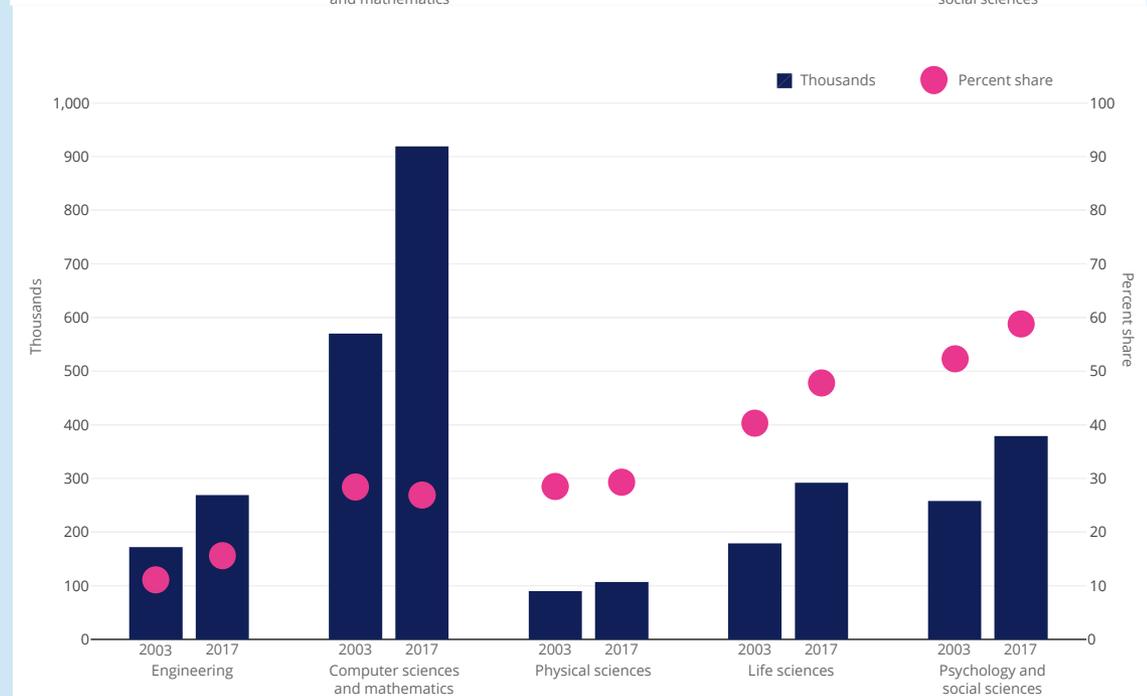
Source: IPEDS, US Census, and APS

# Diversity in STEM Careers

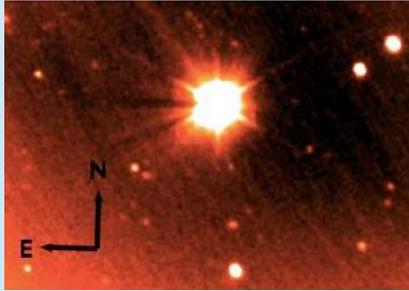
Minorities in STEM Careers by field (NSF National Center for Science and Engineering Statistics - NCSES)



Women in STEM Careers by field (NSF National Center for Science and Engineering Statistics - NCSES)



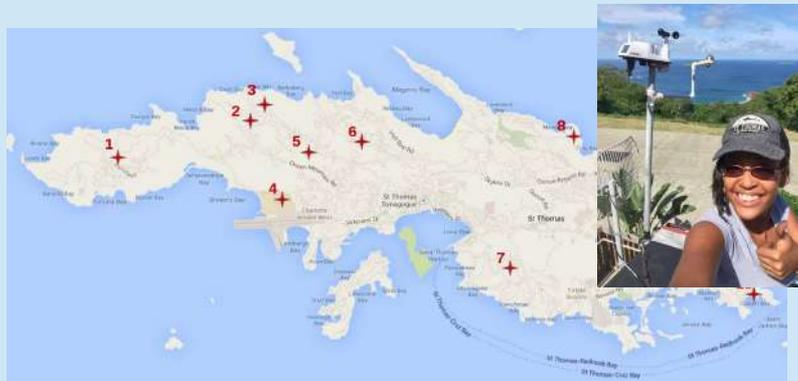
# Enter the UVI Physics Initiative



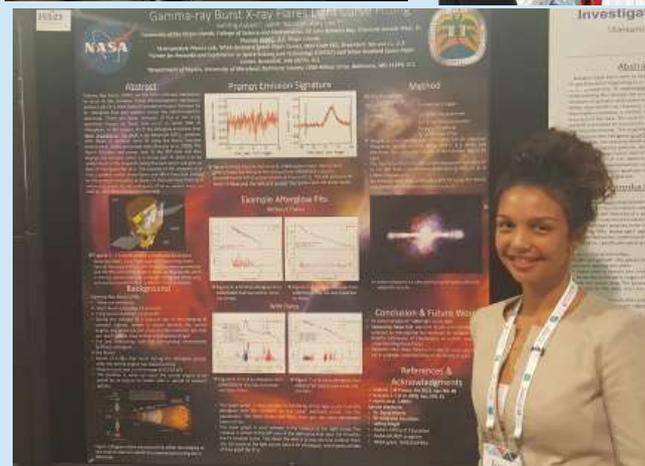
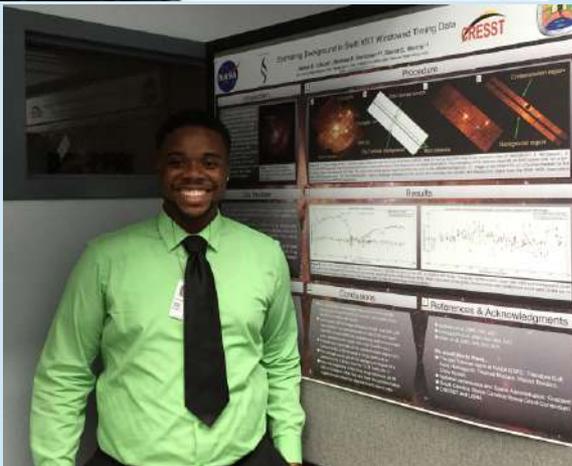
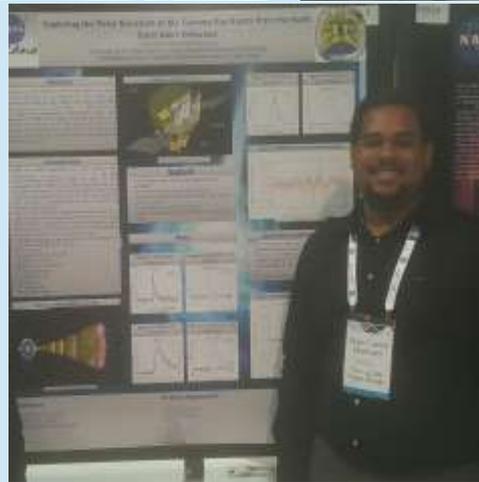
- Drive to educate a new generation of USVI students in physics and engineering disciplines



- VIRT is a central research facility
- Developing pipeline of students from local schools through UVI and beyond to grad-school/employment



- UVI-physics students do research throughout their academic career at UVI
- Opportunities on St. Thomas as well as with partners (NASA-GSFC, Smithsonian Institute (DC), Harvard-SAO, DoD, UAH, UTA, UMD, UWM, UCB, UwA)



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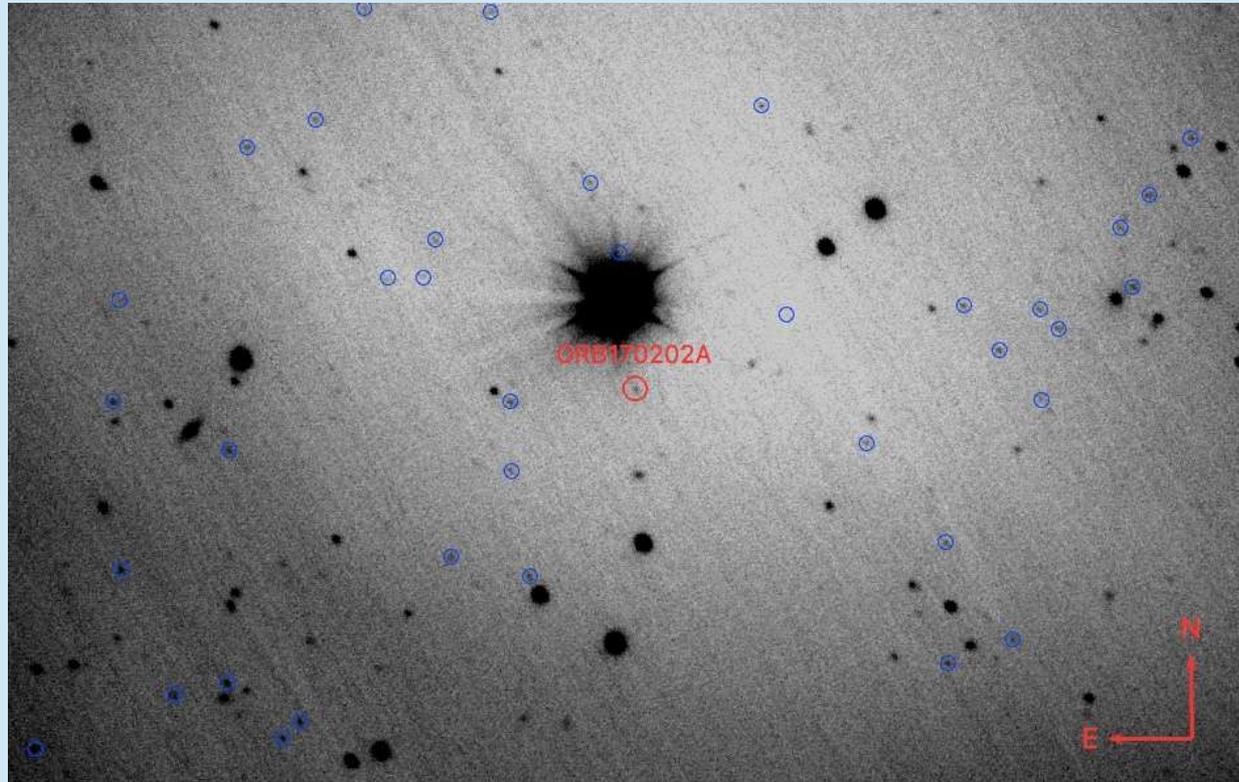
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# VIRT Instrumentation c. 2017



- OMI 0.5m f/10 Cassegrain telescope design
- FLI-IMG4240 camera upgraded into new PL4240 camera body (60s → 1s readout improvement)
  - 20'x20' FOV
  - 0.5" pixels
  - 2048X2048
  - Back-illuminated
- FLI-CW3-12 12-position filter wheel (currently UBVRI-clear)
- Boltwood II Cloud Sensor
- Davis Vantage Pro II weather sensor
- CSIMC-card control of all axes

# VIRT's first GRB



TITLE: GCN CIRCULAR  
NUMBER: 20598  
SUBJECT: GRB 170202A: Etelman Observatory optical observations  
DATE: 17/02/03 22:24:51 GMT  
FROM: Bruce Gendre at ASDC <bruce.gendre@gmail.com>

B. Gendre (UVI), N. Orange (OrangeWave Innovative Science, LLC), D. Morris (UVI), A. Cucchiara (UVI), D. Drost (UVI), T. Giblin (USAF Academy), J. Hakkila (College of Charleston), A. Klotz (IRAP), J. Neff (NSF), D. Smith (UVI), J. Staff (UVI), P. Thierry (Auragne Observatory), R. Watlington (UVI), and L. Wentlent (UVI) report:

We observed the field of GRB 170202A (Racusin et al. GCN 20575) with the 0.5m Virgin Island Robotic Telescope (VIRT) on February the 3rd, starting at 3:16 UT (8.8 hours after the trigger), until 10:30 UT. We performed a series of exposures in the clear filter. The weather conditions were variable with a typical estimated seeing of 2".

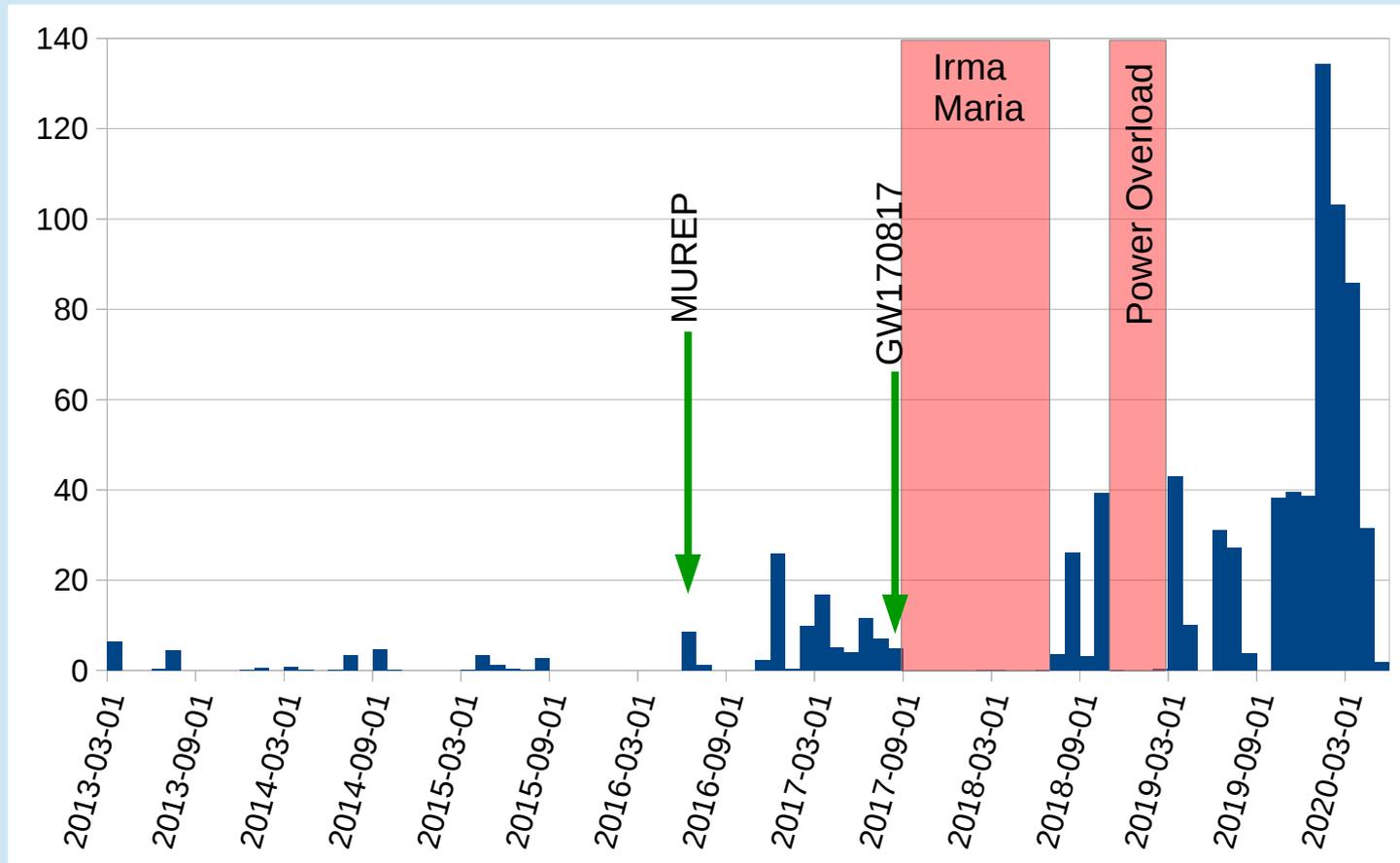
We detected the afterglow observed by UVOT (Racusin et al., GCN 20575) on a combined image (spanning times from 10h to 11.92h after the trigger). Its magnitude, estimated by comparison to nearby USNO-B1 stars, was  $R = 20.8 \pm 0.3$ .

Further analysis is in progress.

Magnitudes have not been corrected for Galactic extinction. The VIRT is still in its commissioning phase.

This message can be cited.

# Impact of new personnel – on science



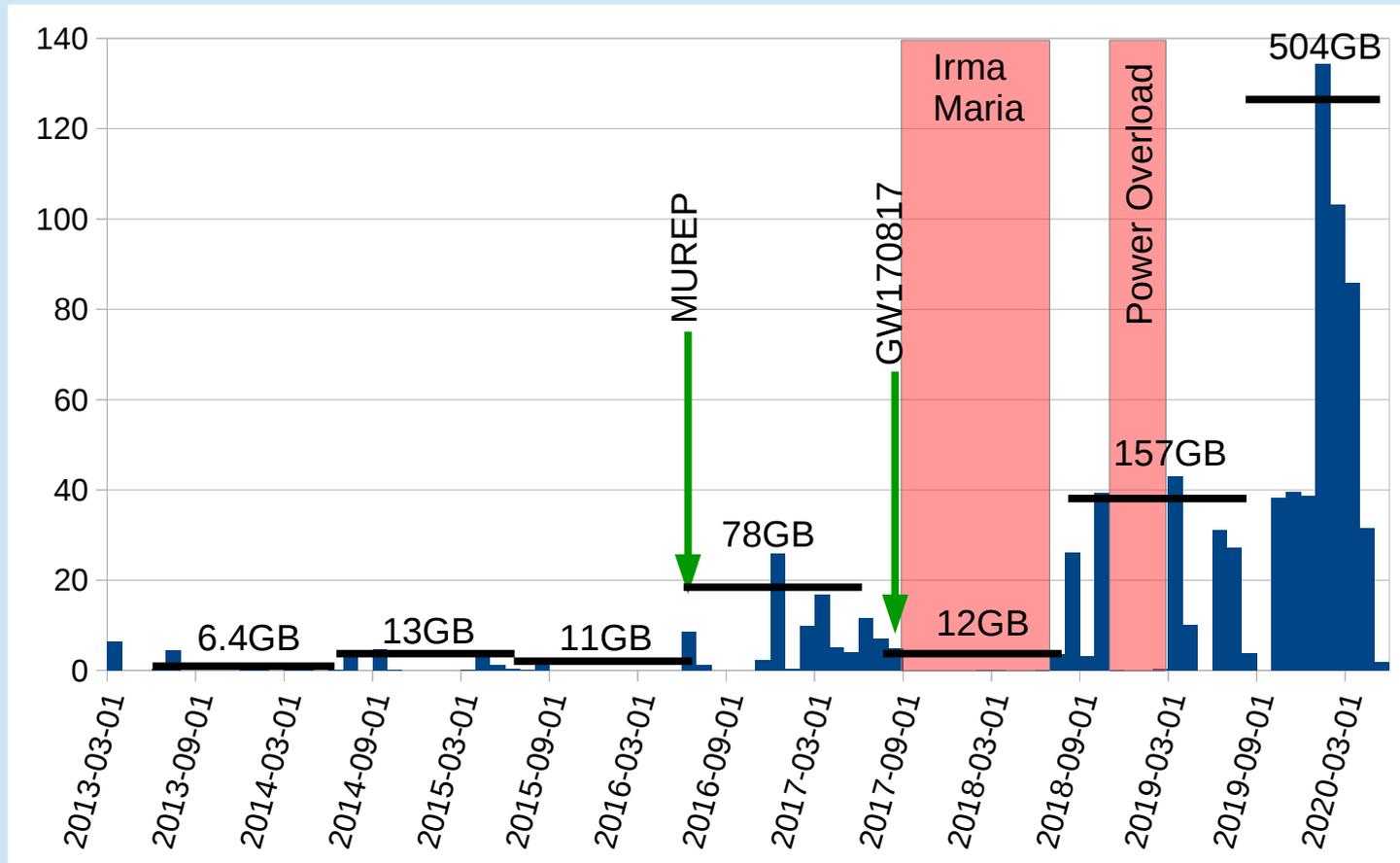
Prior to 2015, the Observatory had always been operated by a single astronomer who also was a full-time teaching faculty at UVI

2015/02 Observatory manager/Software Scientist hired

2015/04 Resident Astronomer/Robotization Scientist hired

2016/09 Two additional GRB researchers hired **MUREP-funded**

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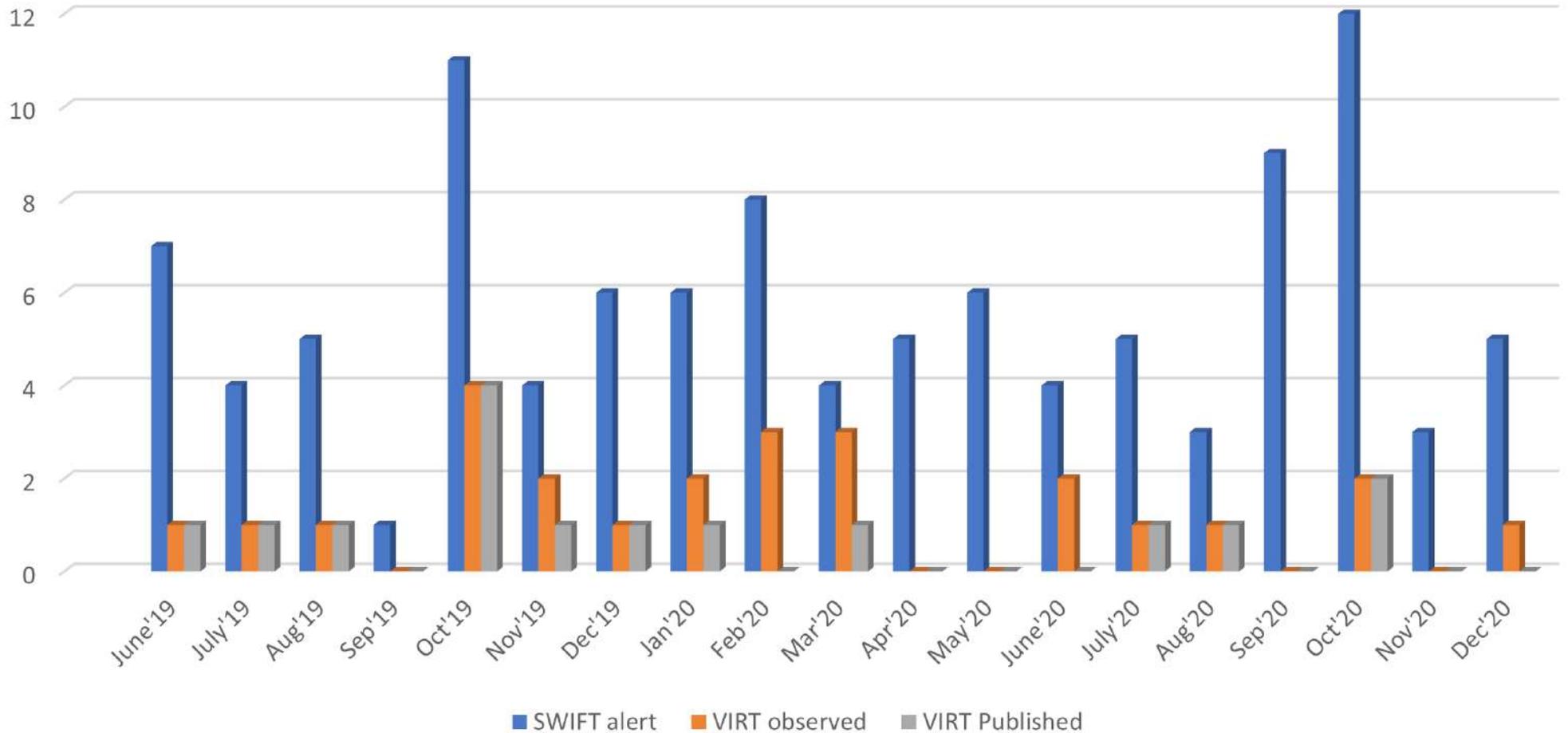
2015/04 Resident Astronomer/Robotization Scientist hired

2016/09 Two additional GRB researchers hired **MUREP-funded**

**x50 increase in science data from pre-MUREP**

# Summary of GRB follow 2019-present

GRBs observed by VIRT and published in GCN



- 5 GRB detections and 15 upper limits reported in 20 months
- See iposters 135.01 Gokuldass et. al. and 139.02 Orange et. al.

# Participants in GW170817 Follow-up

Earth

Space



ESO – LIGO-Virgo Collaboration

# Participants in GW170817 Follow-up

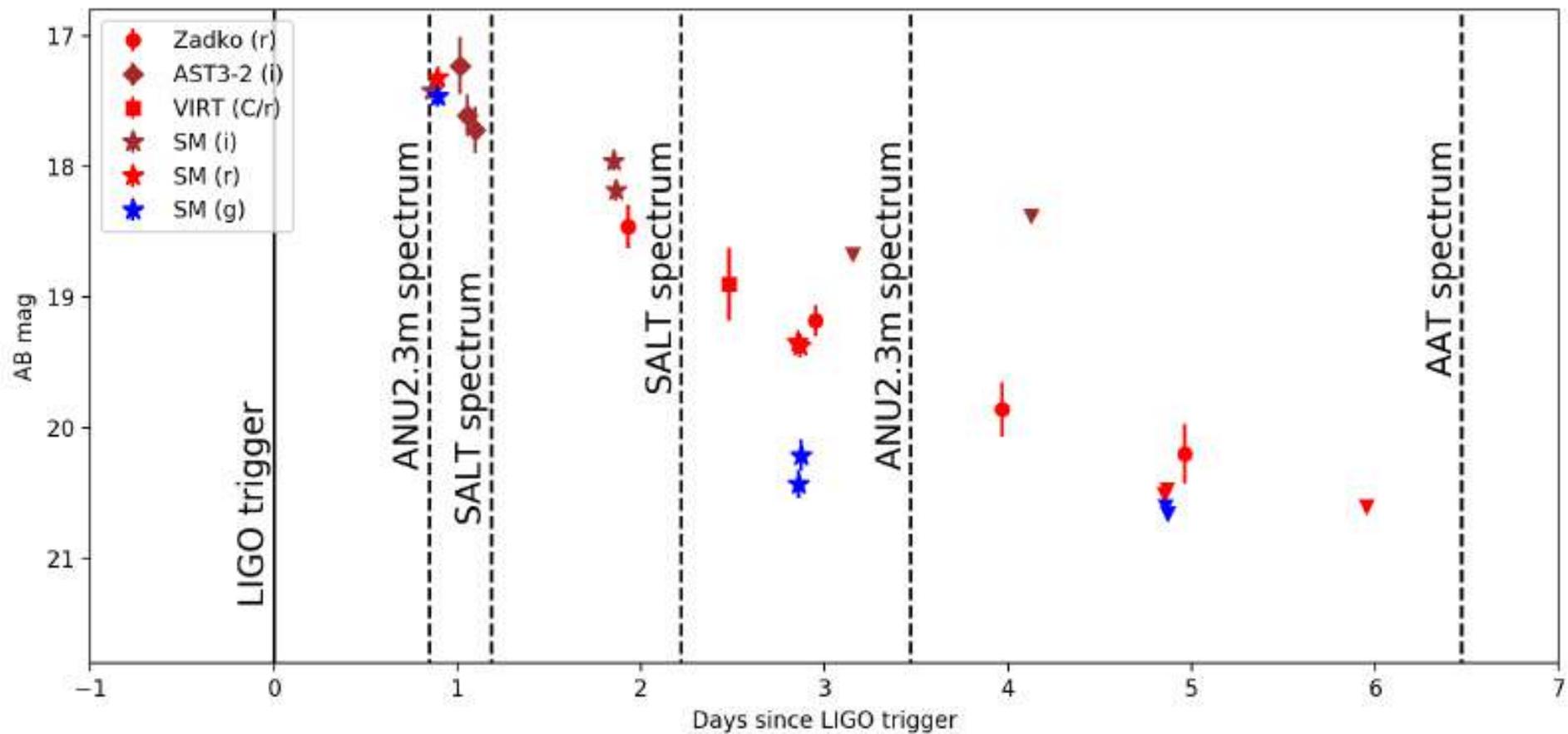
Earth

Space



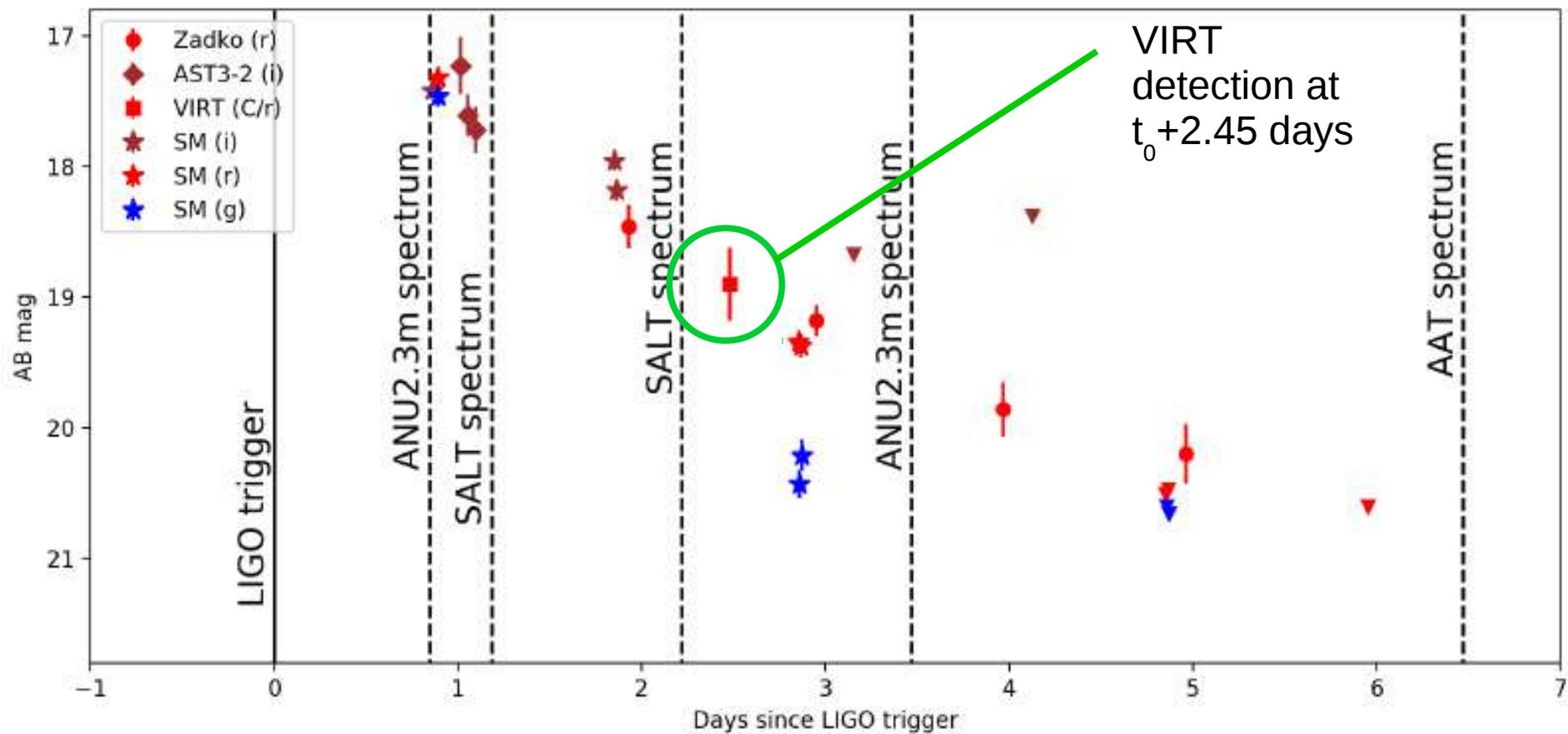
ESO – LIGO-Virgo Collaboration

# Participants in GW170817 Follow-up



Andreoni et al., 2017

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Andreoni et al., 2017

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# 2017 Astrophysics Conferences at UVI



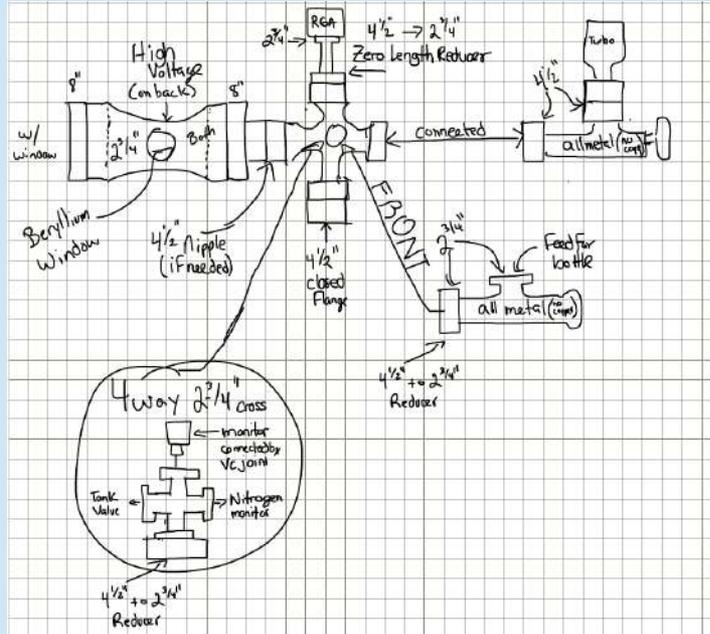
Generation-GW: Diving Into  
Gravitational Waves  
June 5-9, 2017



Unveiling the Physics Behind  
Extreme AGN Variability  
July 10-14, 2017

# Vacuum chamber assembly - 2016

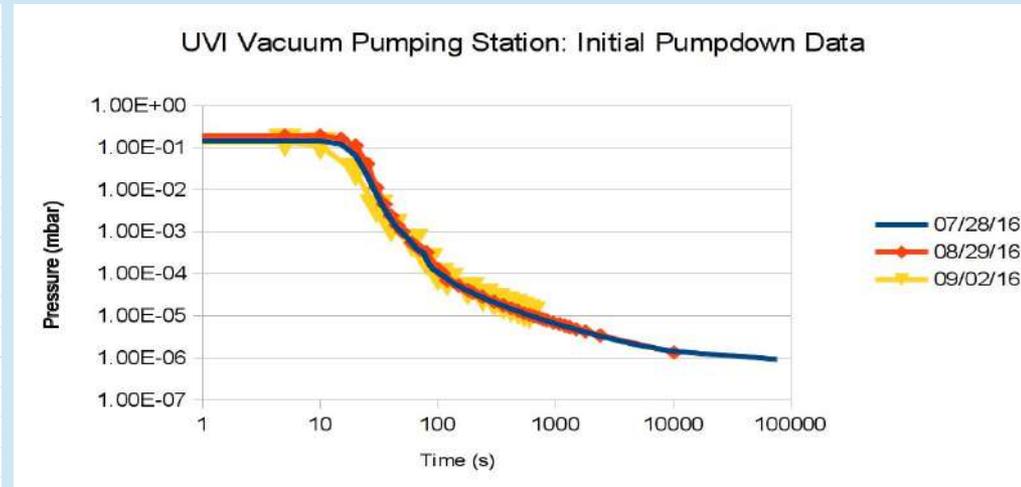
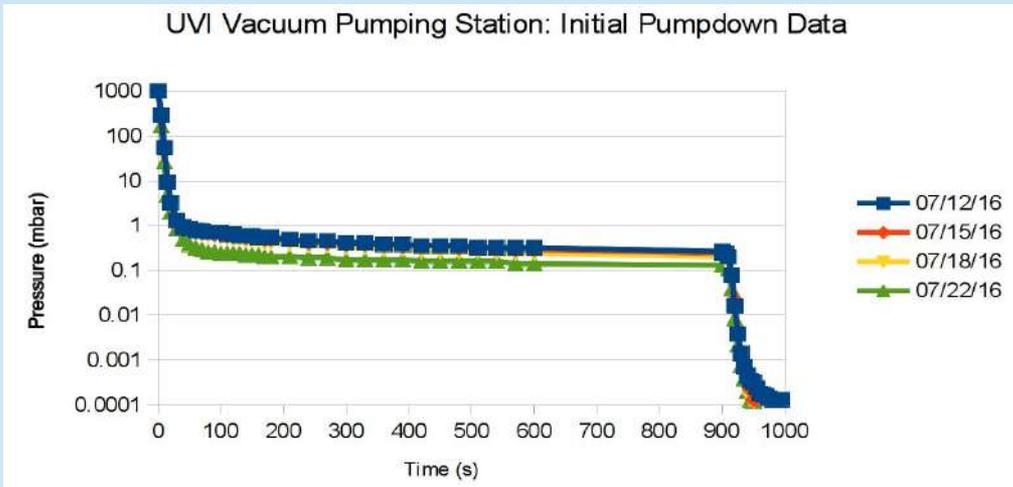
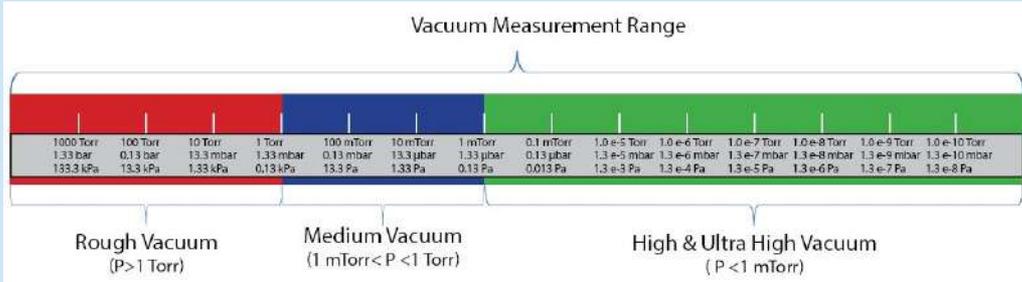
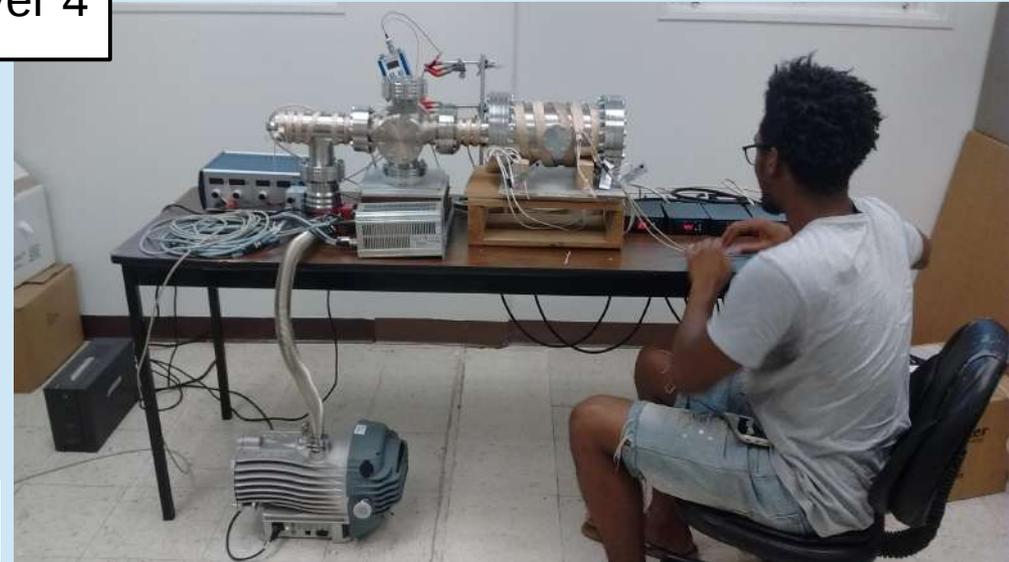
- From student sketch to functioning ultra-high vacuum chamber in 2 years



# Vacuum chamber assembly - 2016

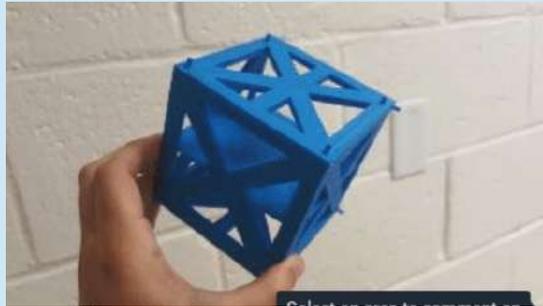
Ver 4

- First high/ultrahigh vacuum achieved in the USVI on July 12, 2016
- Ultimate pressure of  $8.9 \times 10^{-7}$  mbar reached on Sept 2, 2016

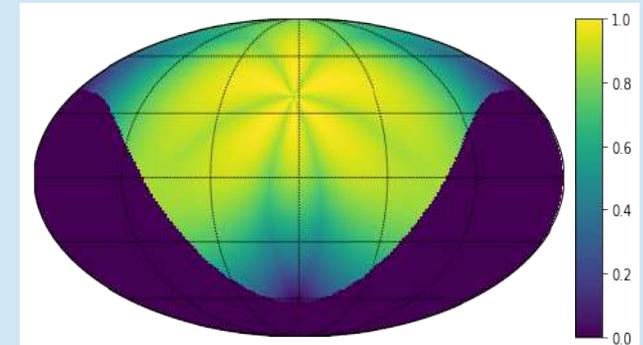
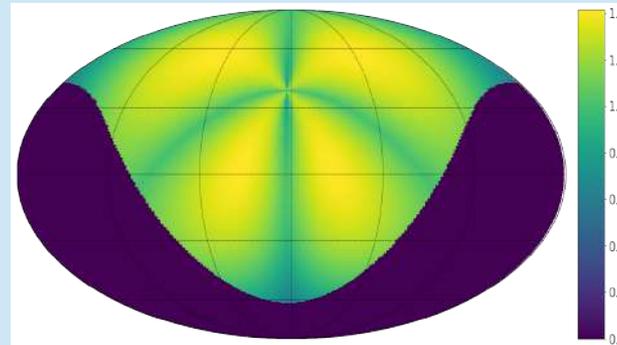
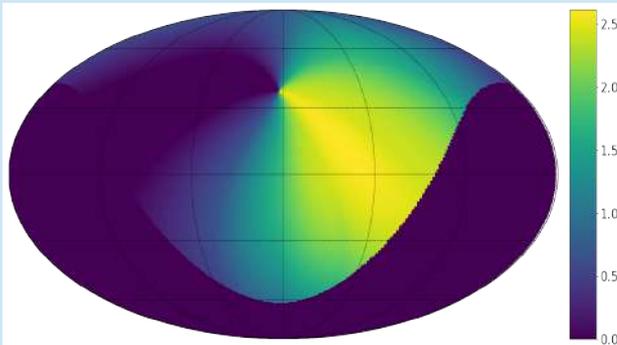


# Vacuum lab upgrades for UVI-GREAT - 2018

- Chamber moved to new dedicated lab space in May 2017
- New UVI-GREAT cubesat project started 2018
- 3d-printer added to lab for rapid prototyping



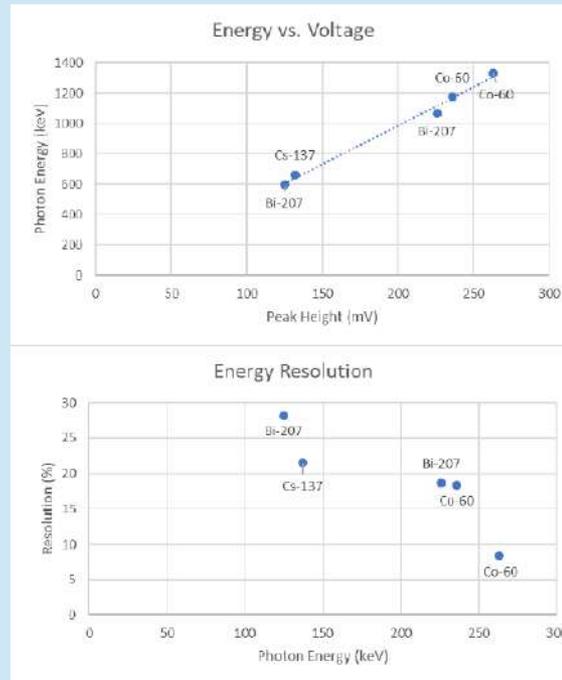
- MEGAlib Simulations in support of UVI-GREAT cubesat design (2018)



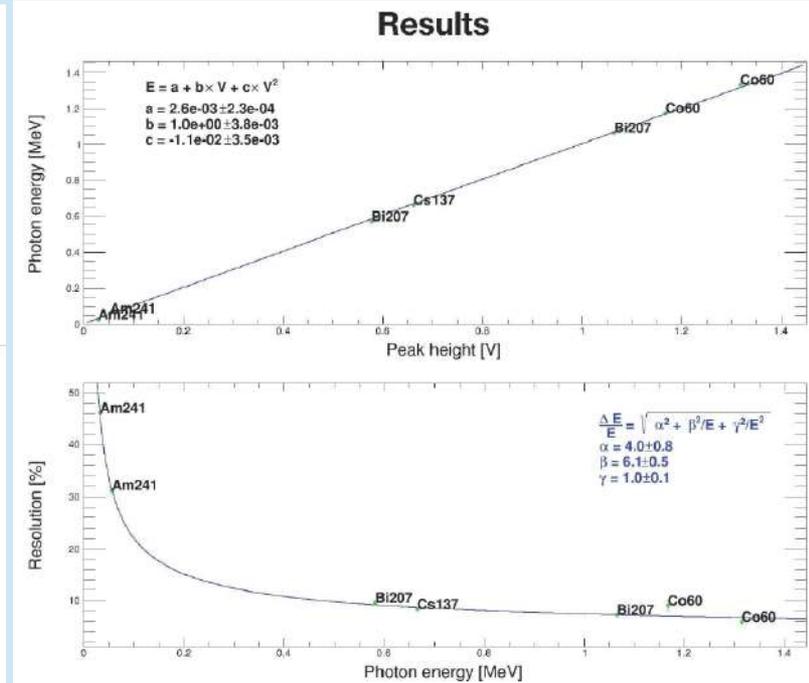
# Vacuum lab upgrades for UVI-GREAT - 2018

- Detector characterization ongoing at GSFC and in UVI lab in parallel
- Printer used in 2020 for COVID19 personal protective equipment production
- Distributed ~250 masks and ~100 faceshields to first responders and UVI personnel

## UVI-GREAT



## BurstCube



# Lots and lots of outreach

Public Observing at Etelman Obs



Starlab Planetarium Events



STARS Amateur Astronomy Club



K-12 Astro Clubs



NSBP Annual Meeting



# Farewell 2017 Great American Eclipse Easternmost Observing Point in the US



# NASA Ed&Outreach Visits to USVI

2016



2017

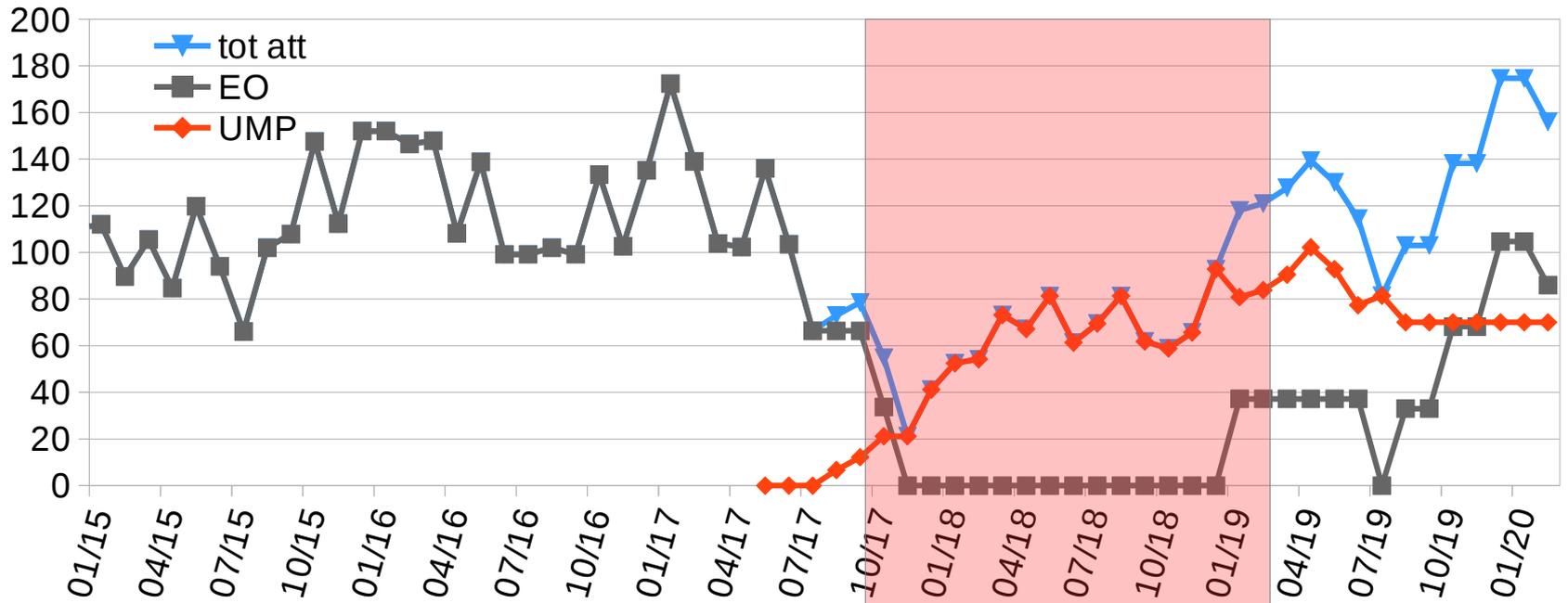


2019

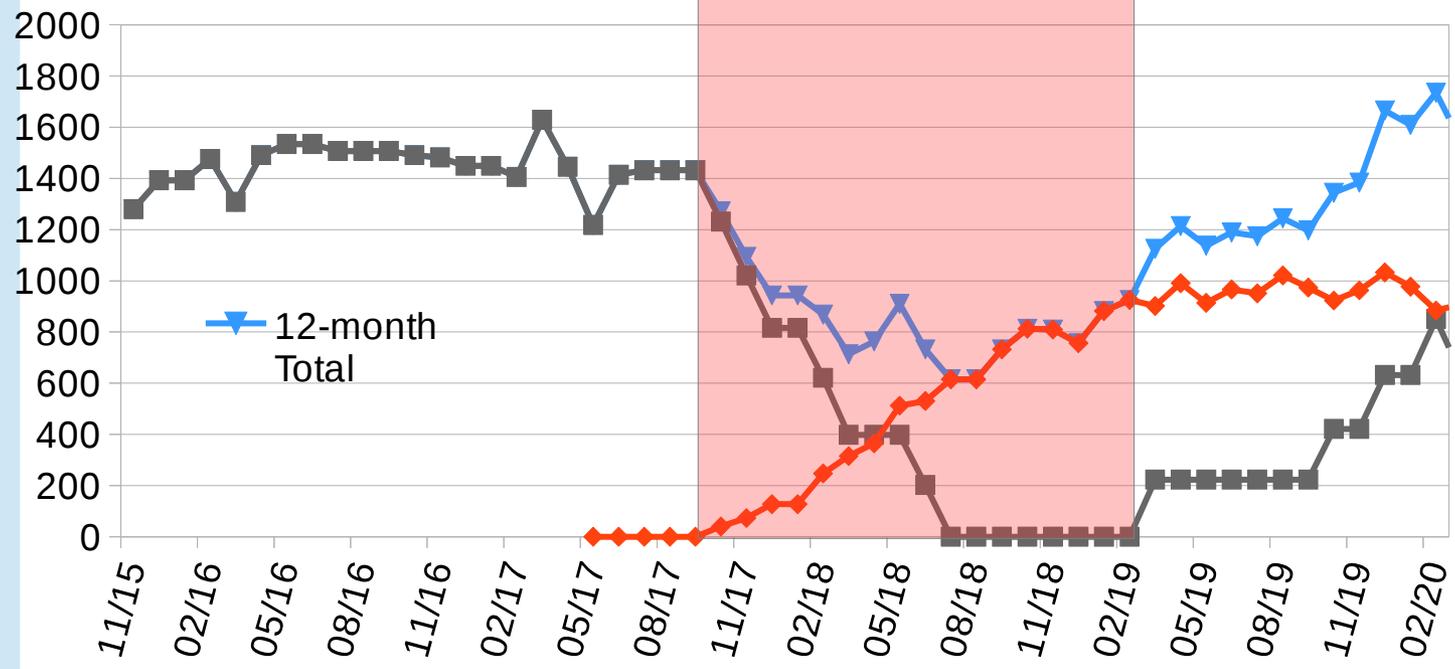


# Total Monthly Attendees

Average Monthly Attendees

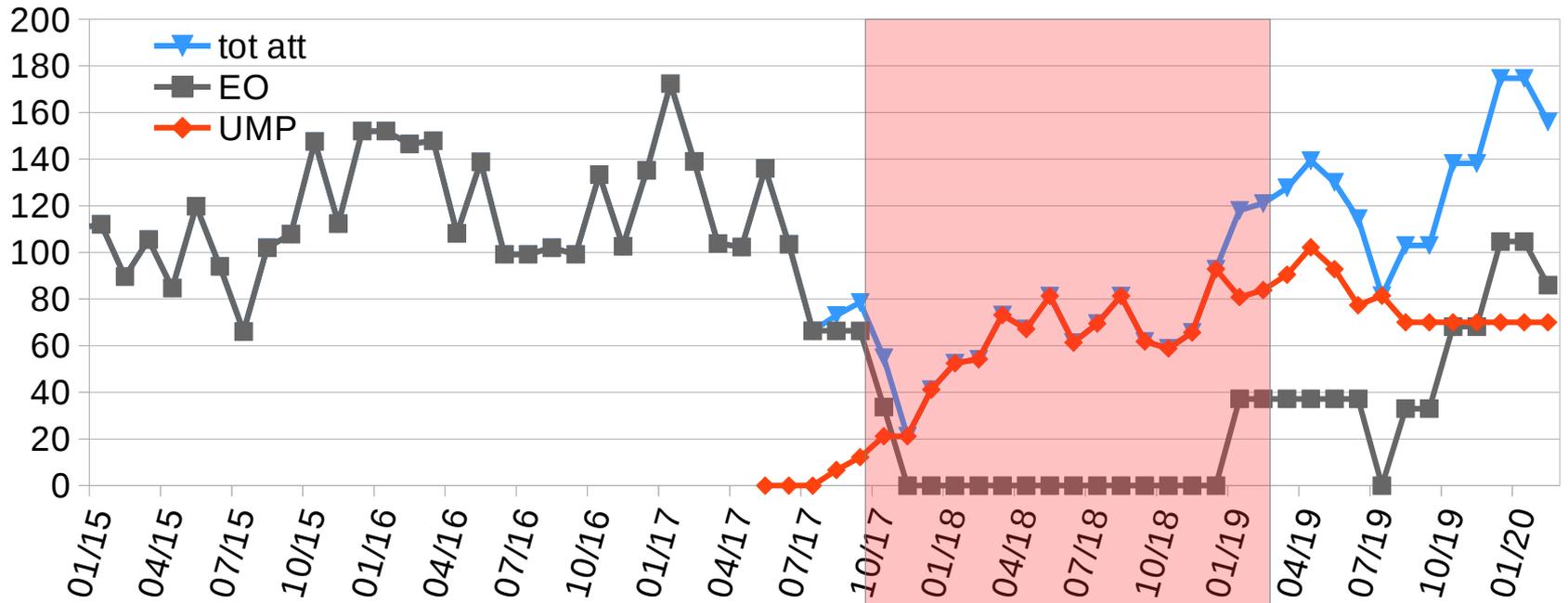


Total Annual Attendees (trailing 12 months)

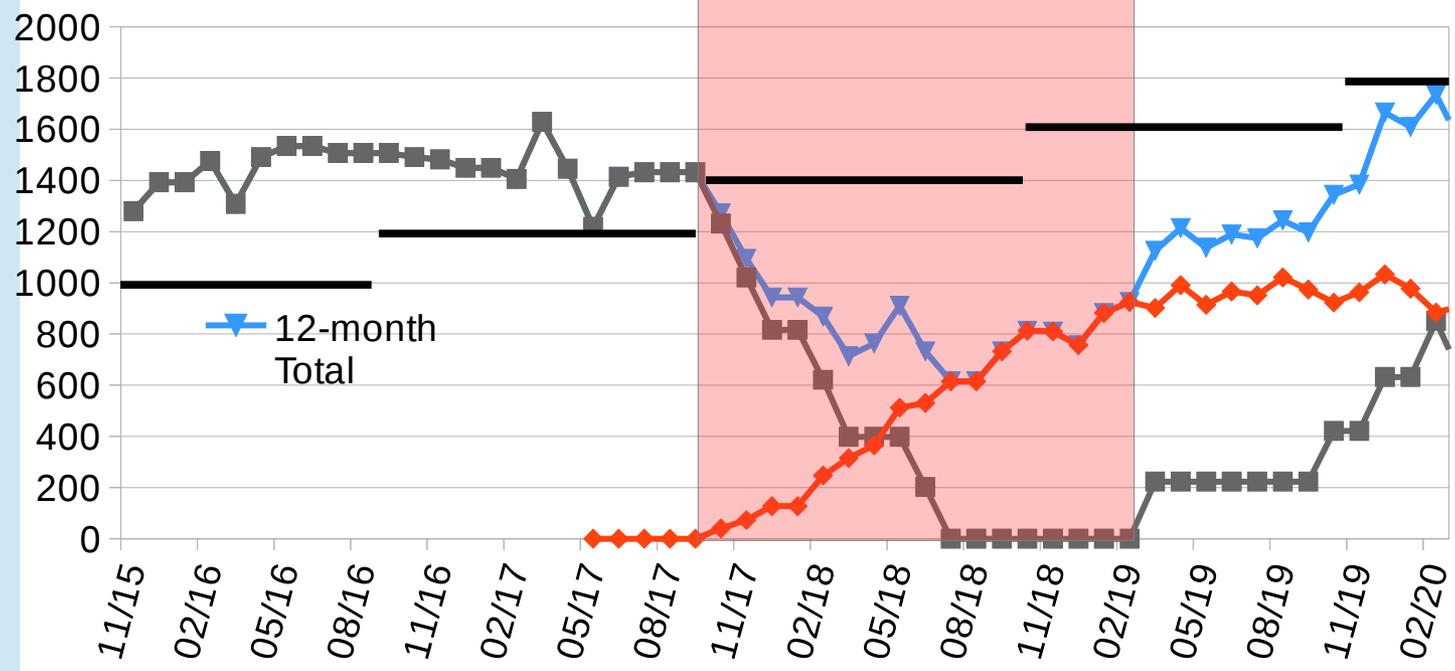


# Total Monthly Attendees

Average Monthly Attendees



Total Annual Attendees (trailing 12 months)



# The First Three Impactors

- May 17, 2019, Azhar Hussein, Jonisha Aubain, and Matthew Fortenberry became first graduating class of physics B.S. students from the University of the Virgin Islands
- In 2017 only 3 HBCUs graduated more than 3 physics BS students: Morehouse, Texas Southern, and Xavier University of Louisiana (avg cost \$30k/yr)



Biophysics  
graduate  
school OSU

High-  
frequency  
finance trading

USVI Science  
secondary  
education

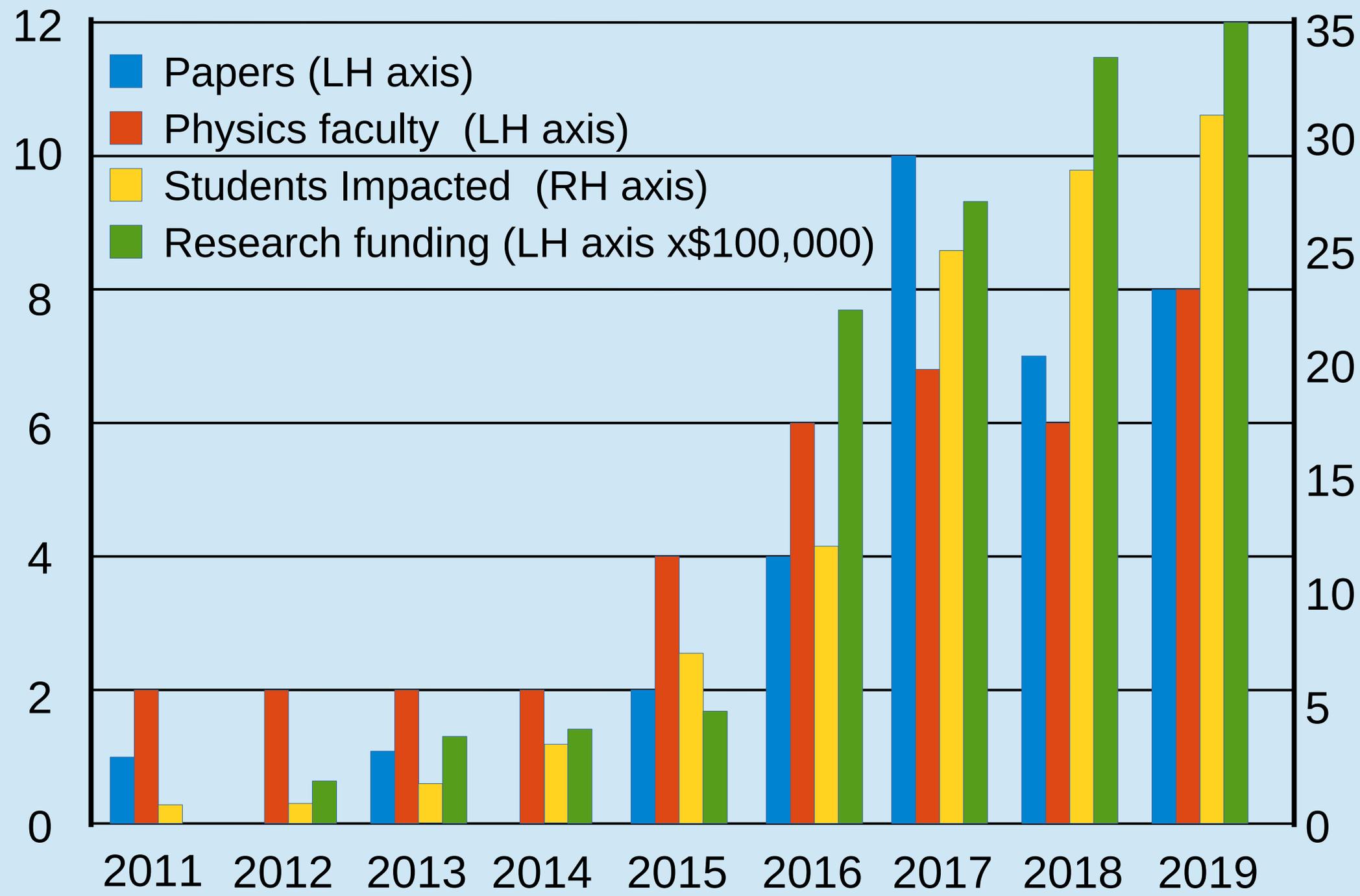
USVI Water  
and Power  
engineering

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# UVI-Physics Partnerships

2015



2016



2017



2018



2019



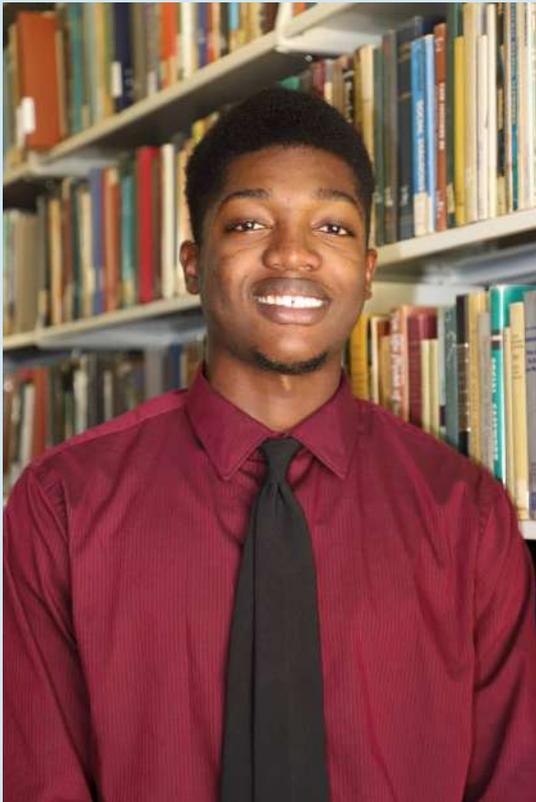
2020



# The Second Three Impactors

- On May 14<sup>th</sup>, 2020, Orian Stapleton and Peter Jean-Baptiste became the second graduating class of physics bachelor of science students from the UVI.
- Chemistry major and Physics A.S. student Fatimah Hussein also graduated in 2020 and is pursuing a PhD in AstroChemistry
- Six students planning to graduate in the UVI class of 2021

Orian Stapleton  
MIT  
Whitehead Institute  
Bioinformatics Technician



Peter Jean-Baptiste  
UVI  
VIVIAN lab  
Lead Instrument Technician

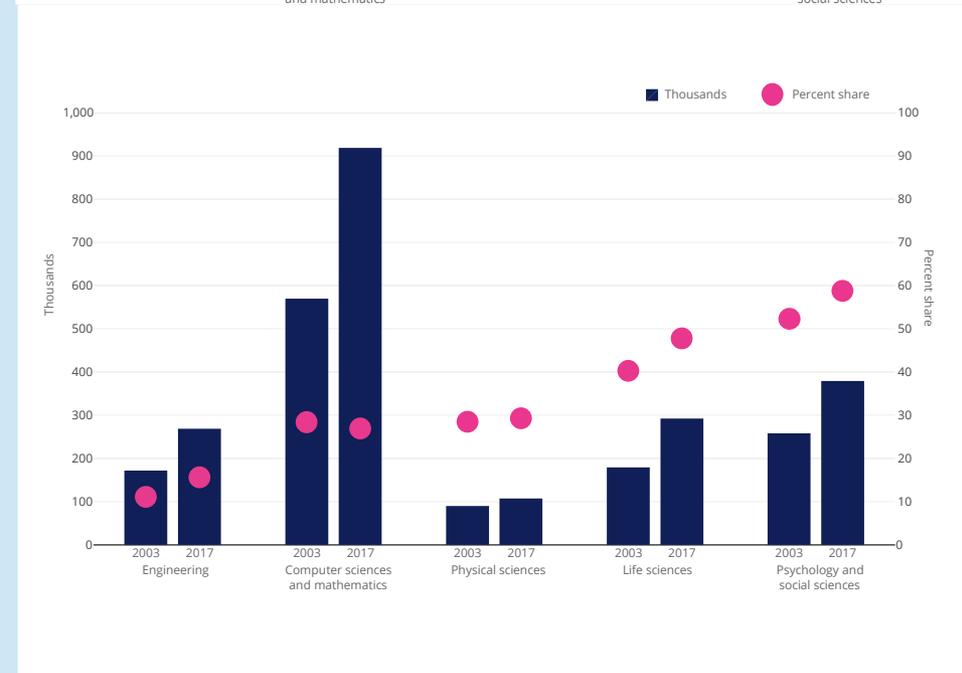
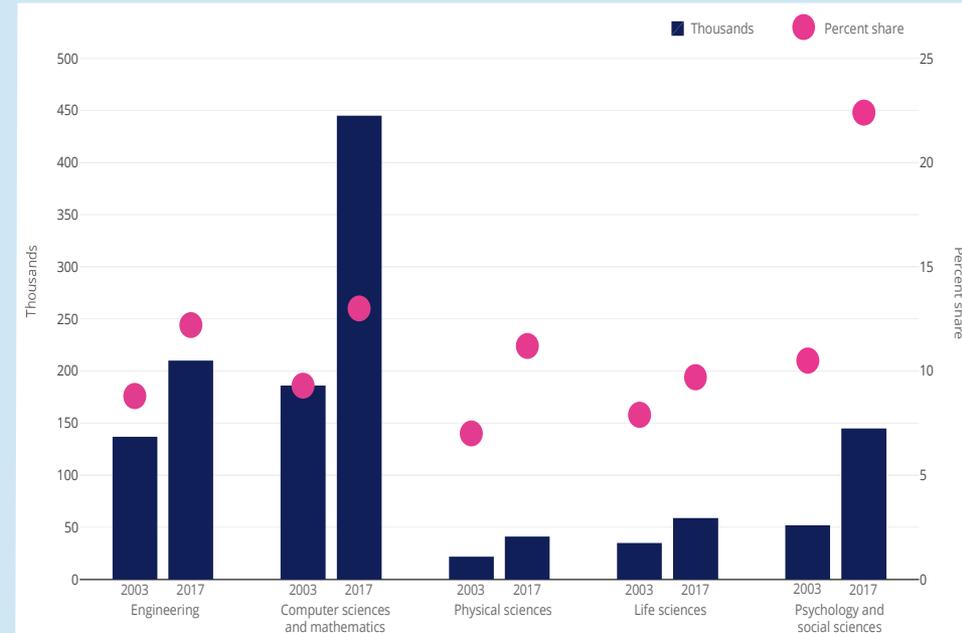
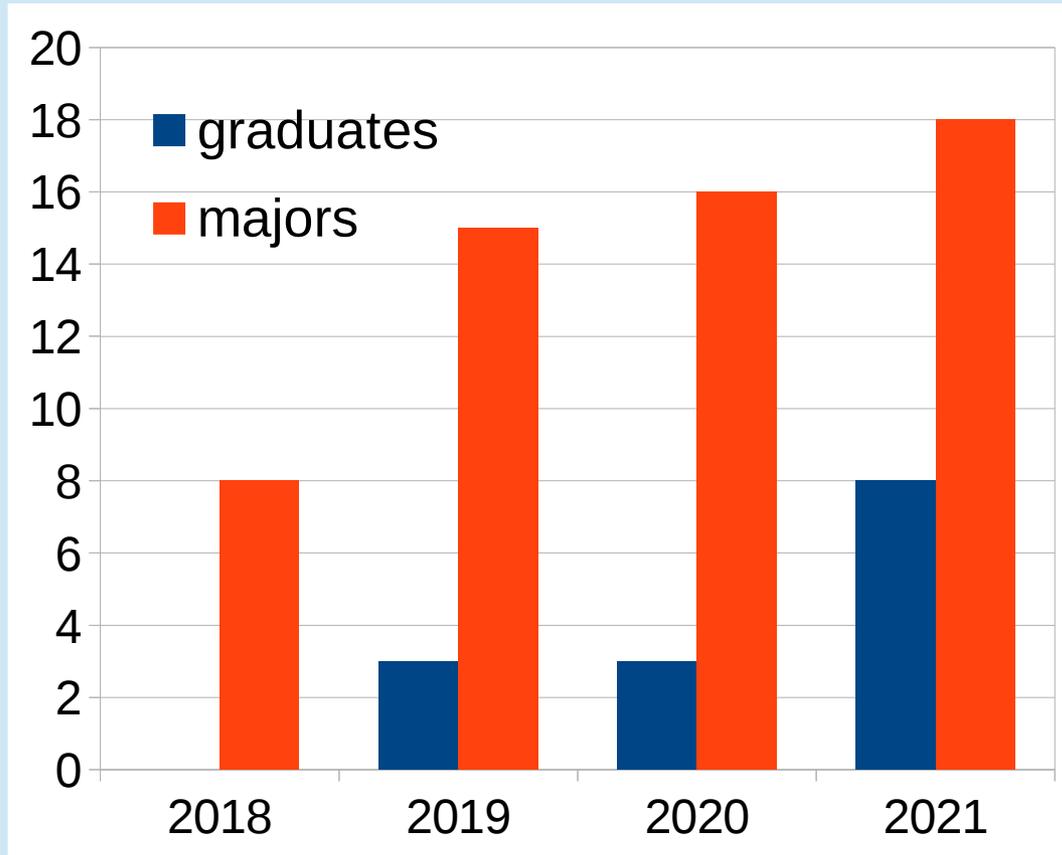


Fatimah Hussein  
University of Virginia  
AstroChemistry  
Bridge-to-PhD Program



# Impact – Addressing Diversity and Inclusion in STEM

## Careers One Physicist at a Time



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## Careers One Physicist at a Time

